

LISTING OF CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 – 17. (Cancelled)

18. (Original) A superconductor integrated circuit comprising:

a base electrode layer;

a tunnel barrier layer disposed above the base electrode layer;

a counter electrode layer disposed above the tunnel barrier layer; and

an anodization ring disposed around a perimeter of the counter electrode layer and a perimeter of the tunnel barrier layer for preventing a short-circuit between an outside contact and the base electrode layer,

wherein:

a tunnel junction region is defined by the counter electrode layer, the tunnel barrier layer and the base electrode layer, the tunnel junction region including a junction contact defined by a top surface of the counter electrode, the junction contact having a diameter of approximately 1.00 μm or less.

19. (Original) The superconductor integrated circuit of claim 18, wherein the base electrode includes an electrode isolation region disposed approximately 0.8 μm or less in horizontal distance from the junction contact for providing device isolation.

20. (Original) The superconductor integrated circuit of claim 18, further comprising a patterned oxide layer disposed above the base electrode layer and the anodization ring for defining an outside contact via and a base electrode via, wherein a surface area of the outside contact via is greater than a surface area of the junction contact.

21. (Original) The superconductor integrated circuit of claim 20, further comprising a wire layer disposed above the oxide layer for providing an outside contact and a base electrode contact, wherein a surface area of the outside contact is greater than a surface area of the junction contact.

22. (Original) The superconductor integrated circuit of claim 18, wherein the counter electrode layer is disposed solely within the anodization ring.

23. (Original) The superconductor integrated circuit of claim 18, wherein the anodization ring is comprised of an anodized portion of the counter electrode layer, an anodized portion of the tunnel barrier layer and an anodized portion of the base electrode layer.

24. (Original) The superconductor integrated circuit of claim 18, wherein the tunnel barrier layer is disposed solely within the anodization ring.

25. (Original) The superconductor integrated circuit of claim 18, wherein:
the base electrode layer and the counter electrode layer are comprised of niobium;
the tunnel barrier layer is comprised of a layer of aluminum and a layer of Al_2O_3 disposed above the layer of aluminum; and
the anodization ring is comprised of Al_2O_3 and Nb_2O_5 .

26. (Previously presented) The superconductor integrated circuit of claim 23, wherein the anodized portion of the counter electrode layer extends upwardly around the perimeter of the counterelectrode layer from the anodized portion of the tunnel barrier layer and the anodized portion of the base electrode layer, an associated diameter of the anodized portion of the counter electrode layer being less than an associated diameter of the anodized portion of the tunnel barrier layer and the anodized portion of the base electrode layer.

27. (New) A superconductor integrated circuit comprising:
a base electrode layer;
a tunnel barrier layer disposed above the base electrode layer;
a counter electrode portion disposed above an unexposed portion of the tunnel barrier layer; and
an anodization ring disposed around a perimeter of the counter electrode portion and around the unexposed portion of the tunnel barrier layer for preventing a short-circuit between an outside contact and the base electrode layer,
wherein:

a tunnel junction region is defined by the counter electrode layer, the unexposed portion of the tunnel barrier layer and the base electrode layer, the tunnel junction region including a junction contact defined by a top surface of the counter electrode, the junction contact having a diameter of approximately 1.00 μm or less.

28. (New) A superconductor integrated circuit comprising:

a base electrode layer;

a tunnel barrier layer disposed above the base electrode layer;

a counter electrode portion disposed above an unexposed portion of the tunnel barrier layer; and

an anodization layer formed from at least a portion of the base electrode layer and an exposed portion of the tunnel barrier layer and an anodization ring disposed laterally around a perimeter of the counter electrode portion and around the unexposed portion of the tunnel barrier layer for preventing a short-circuit between an outside contact and the base electrode layer,

wherein:

a tunnel junction region is defined by the counter electrode layer, the unexposed portion of the tunnel barrier layer and the base electrode layer, the tunnel junction region including a junction contact defined by a top surface of the counter electrode, the junction contact having a diameter of approximately 1.00 μm or less.